

Diet, Obesity, Fat Cells, Inflammation, and Cancer

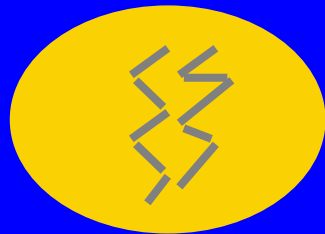
David Heber, M.D.,Ph.D.

Professor of Medicine and Public Health
and Director,

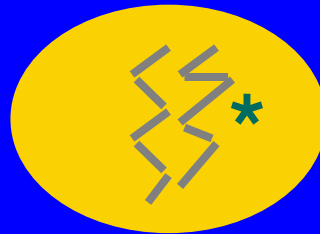
UCLA Center for Human Nutrition
David Geffen School of Medicine at UCLA

Carcinogenesis

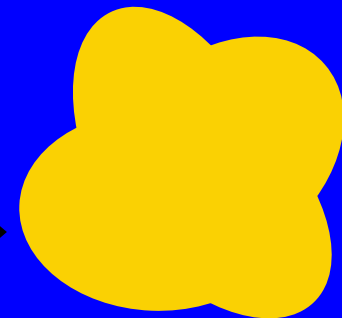
Normal Cell



Cell with DNA
abnormality



Tumor



MUTATION

Inherited
Spontaneous
Acquired

PROMOTION PROGRESSION

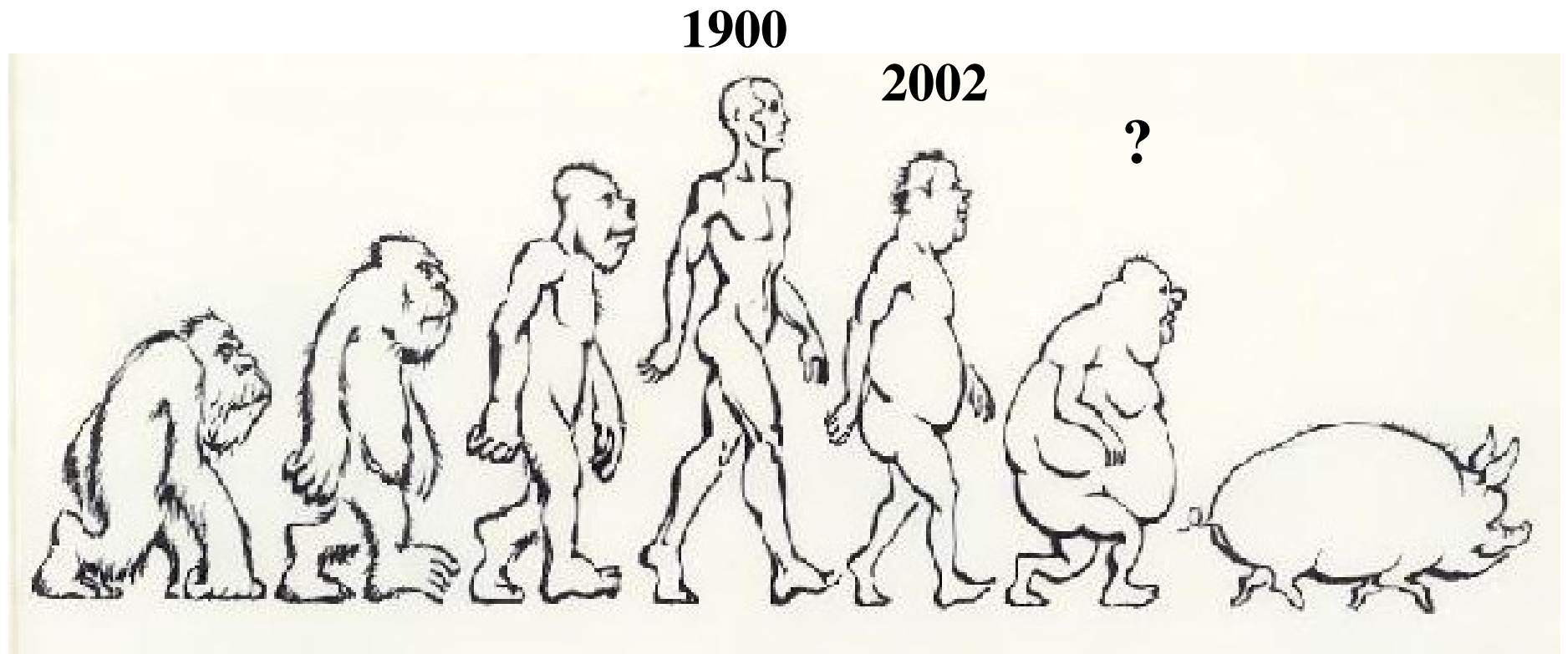
Hormones (e.g. IGF-1)
Angiogenesis
Inflammation
Cytokines /Chemokines

Diets and Cancer

- Populations eating a plant-based diet have lower rates of cancer, heart disease, diabetes and obesity, but when these people move to the U.S. their incidence of cancer increases within 1 generation.
- Over 50% of Americans are overweight or obese and 50% do not eat a single piece of fruit each day. 80% of Americans do not meet NCI recommendations for 5 to 9 servings/day.
- Ancient man ate over 800 varieties of plant foods of low energy density but rich nutrient density. Modern foods are just the opposite.

**Well-Adapted to Starvation and Fighting Infection:
Poorly Adapted to Overnutrition and Excess Inflammation**

Evolution of Man



With Apologies to Stephen Jay Gould

Immunosuppression,
susceptibility to
infection

Malnutrition

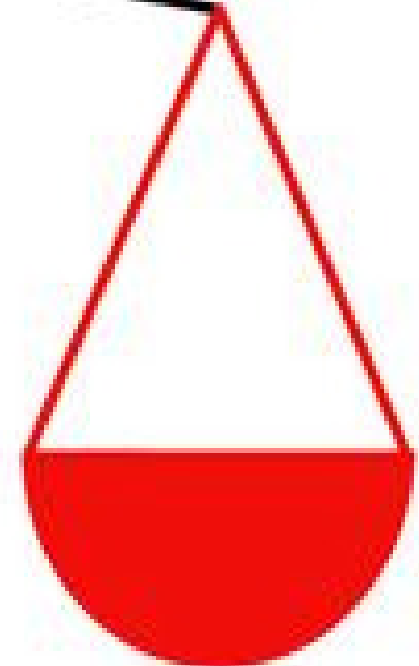
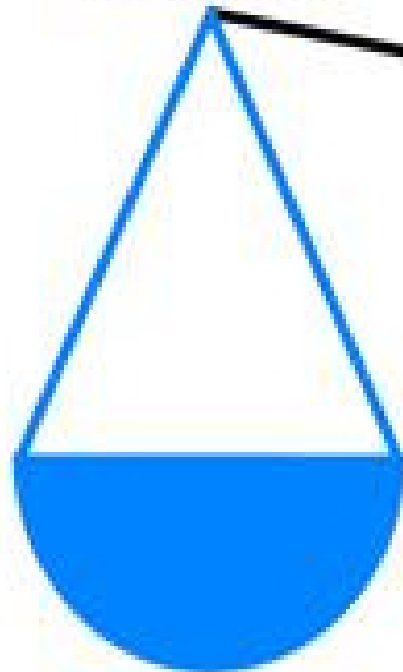
Normal immune
function

Optimal
nutrition

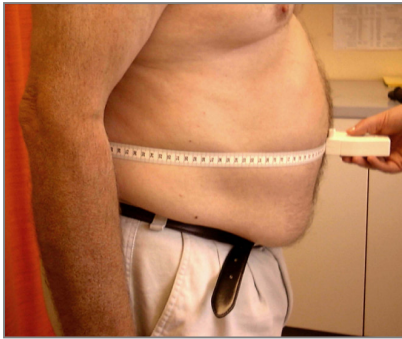
Immunoactivation,
susceptibility to
inflammatory disease

Overnutrition

**LINKS BETWEEN
METABOLISM AND
INFLAMMATION**



Role of Abdominal Adipocytes in Insulin Resistance, Inflammation and Cancer



Abdominal Adipocytes



Inflammation

+

Insulin Resistance



Metabolic Syndrome



**Heart Disease, Diabetes
and Some Forms of Cancer**

FEBRUARY 23, 2004

TIME

BUSH'S
MILITARY RECORDS
IS DISNEY MOUSETRAPPED?

THE SECRET KILLER

- The surprising link between **INFLAMMATION** and **HEART ATTACKS, CANCER, ALZHEIMER'S** and other diseases
- What you can do to fight it

www.time.com AOL Keyword: TIME

Pro-Inflammatory Nutrition Subject to Genetic Variation

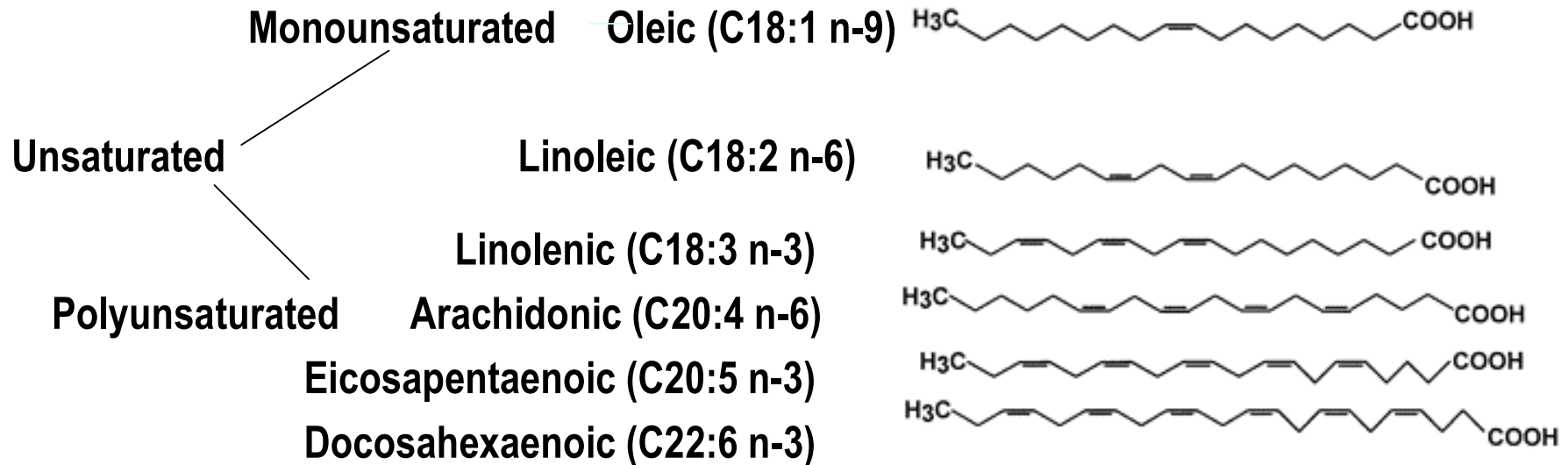
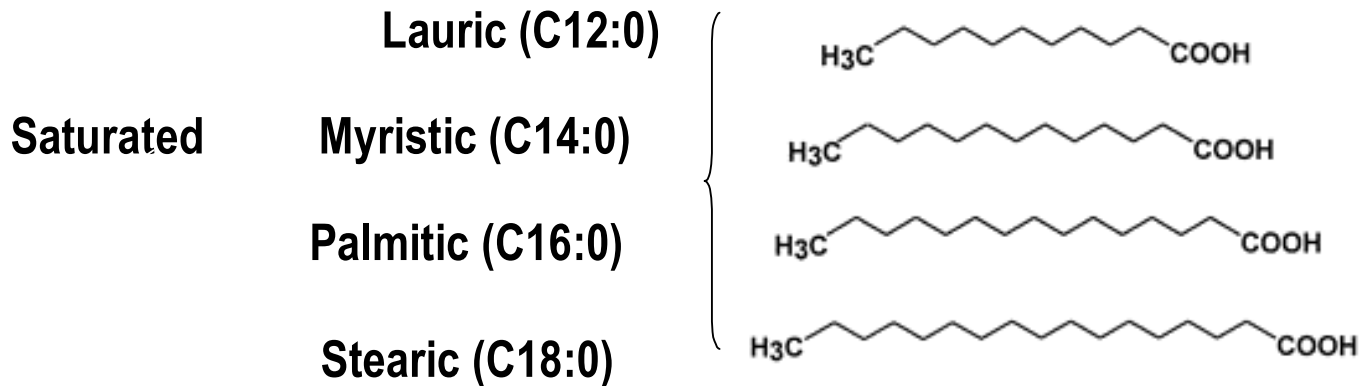
- Positive Energy Balance/Abdominal Obesity with Increased IGF-1 and Inflammation
- Increased Omega-6 Fatty Acids with Decreased Omega-3 Fatty Acids
- Decreased Anti-Inflammatory Phytochemicals – Due to Low Fruit/Vegetable Intake
- Inadequate Induction of Detoxifying Enzymes
- Decreased Fiber Intake/Increased Transit Time with Inadequate Probiotic Bacteria

Balancing Essential Fats in Foods

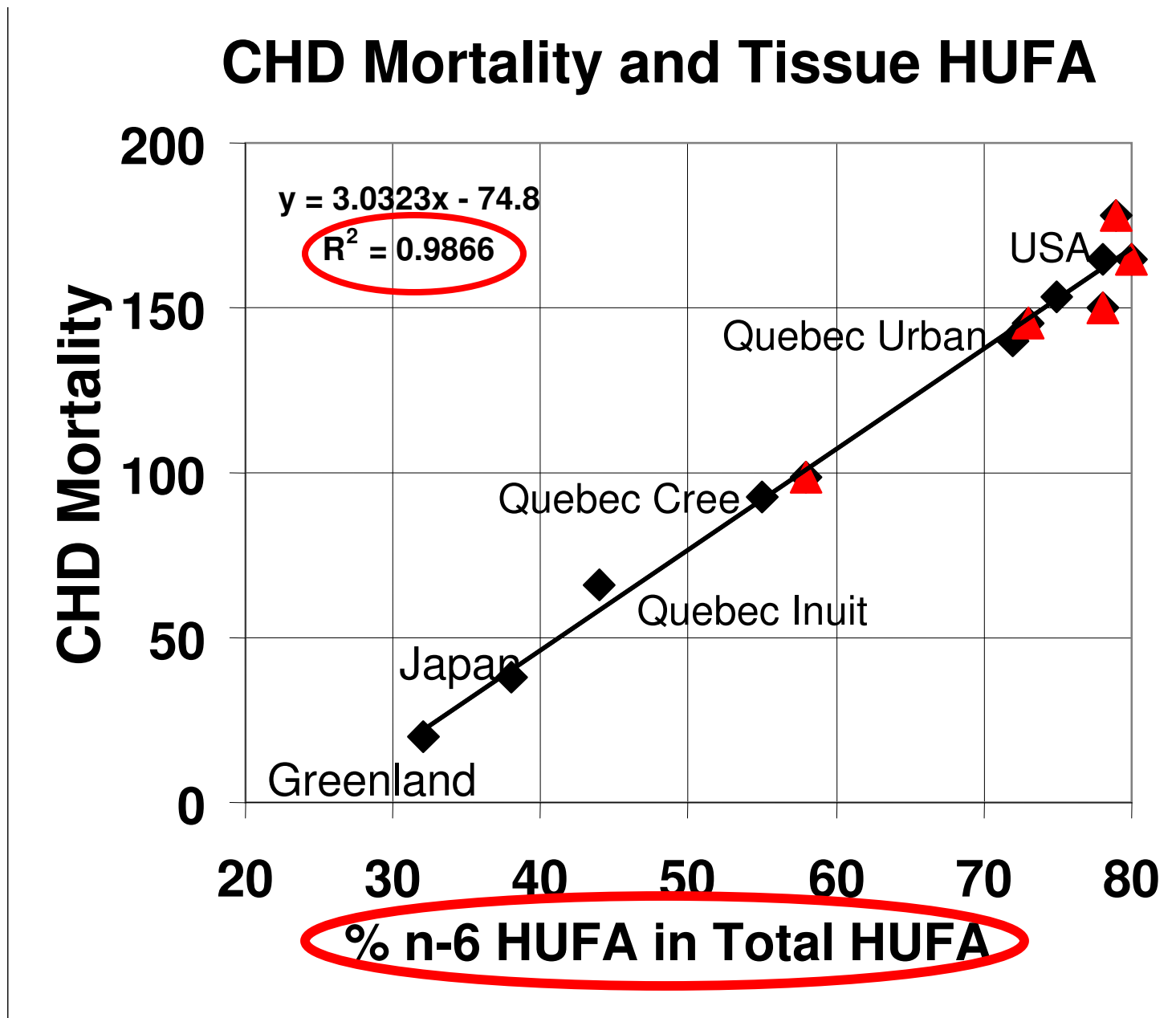


Promotes Health
and
Prevents Disease

Fatty Acids in Dietary Fats



HUFA imbalance is a diet-induced dyslipidemia
HUFA are long-chain highly unsaturated fatty acids



Infections and Human Cancer*

IARC Group 1 Carcinogens: “...the agent (mixture) is carcinogenic to humans...”

10 of 64 Group 1 Carcinogens are infectious agents

Epstein-Barr virus

Helicobacter pylori (infection with)

Hepatitis B virus (chronic infection with)

Hepatitis C virus (chronic infection with)

Human immunodeficiency virus type 1 (infection with)

Human papillomavirus type 16

Human papillomavirus type 18

Human T-cell lymphotropic virus type I

Opisthorchis viverrini (infection with)

Schistosoma haematobium (infection with)

*World Health Organization International Agency for Research on Cancer (IARC); see www.iarc.fr

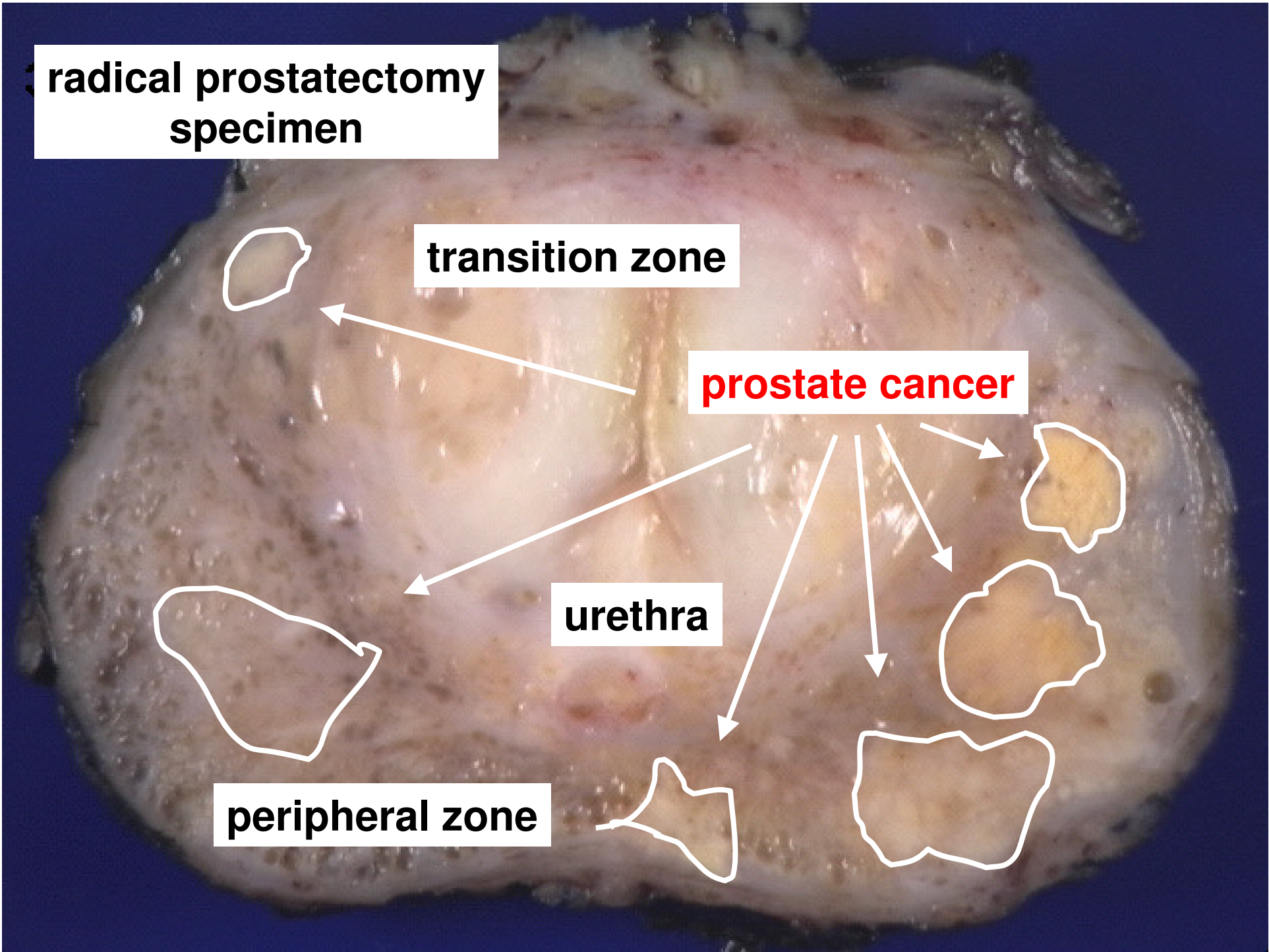
**radical prostatectomy
specimen**

transition zone

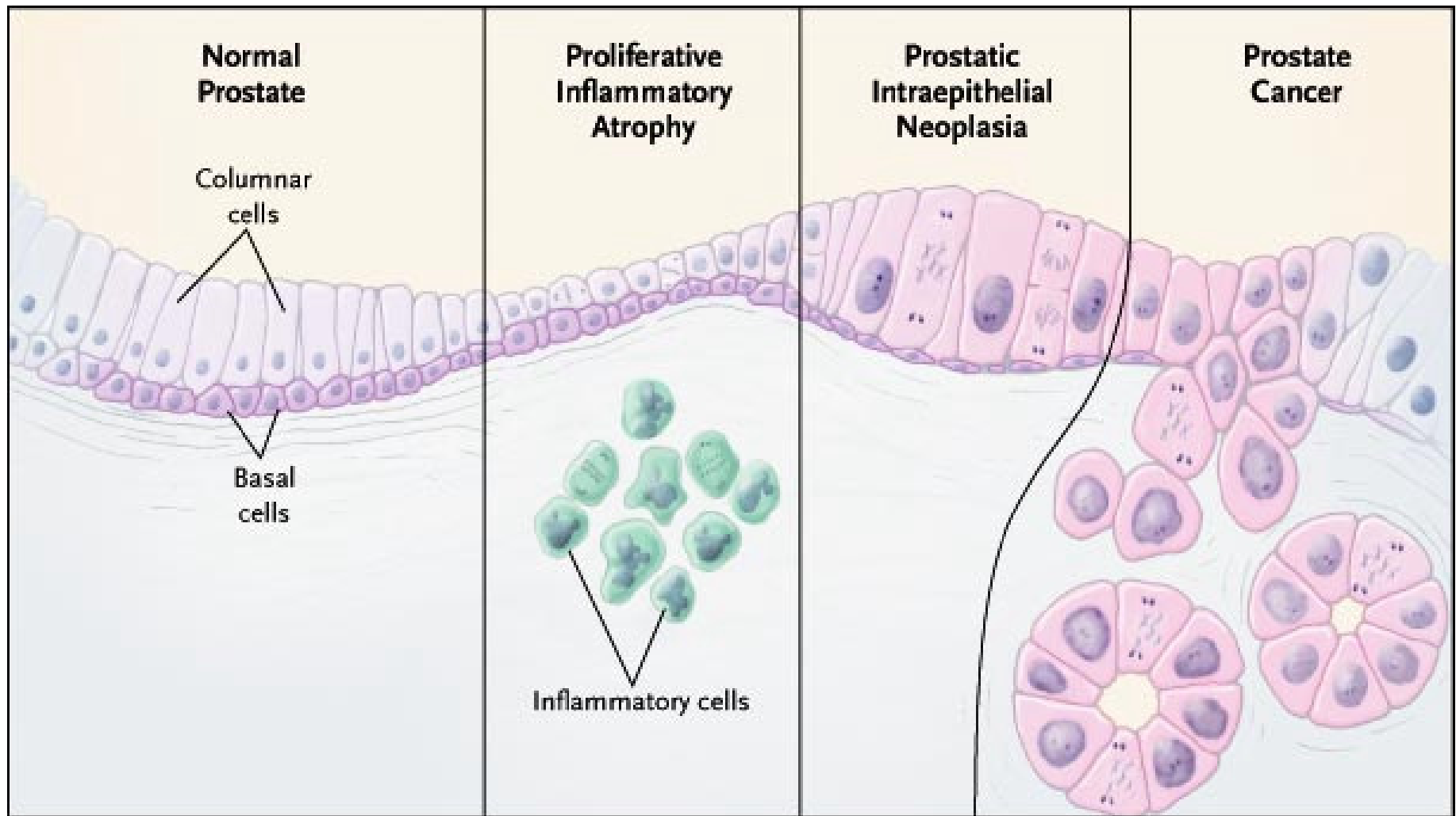
prostate cancer

urethra

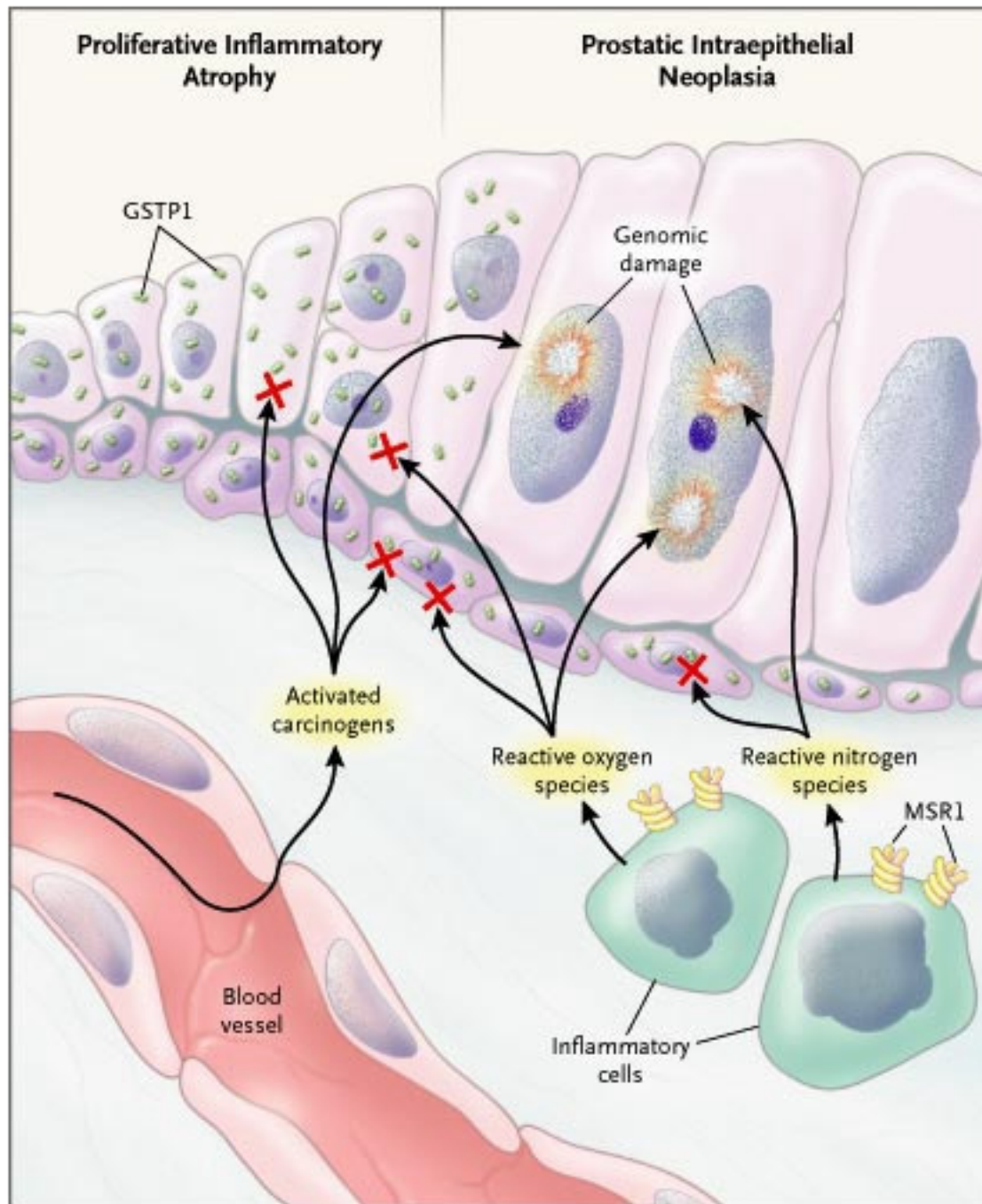
peripheral zone



Proliferative Inflammatory Atrophy May be a Precursor to Prostate Cancer*



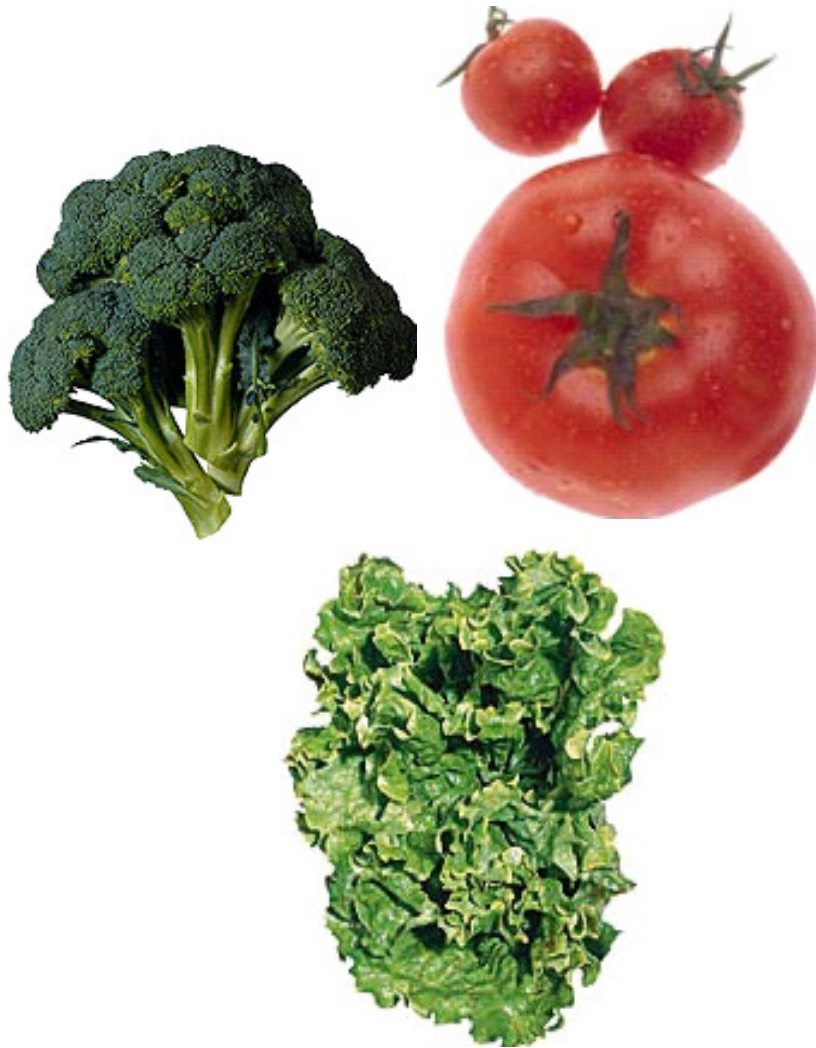
***Nelson WG *et al.* New Engl J Med 349: 366-81 (2003).**



**Nelson WG *et al.*
 New Engl J Med
 349: 366-81 (2003).**

The Diet and Prostate Cancer

“Good”



“Bad”



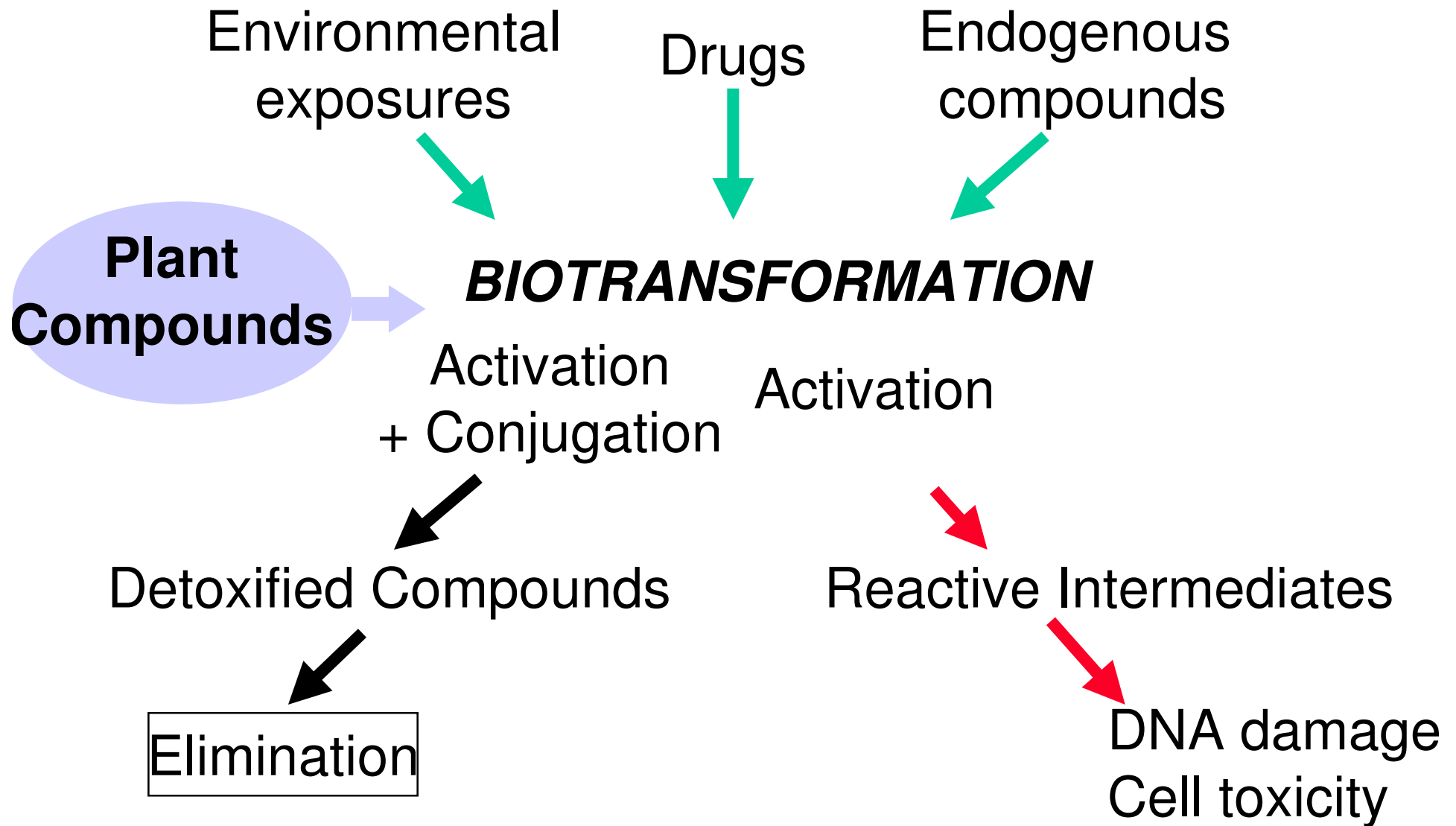
GSTM1 null genotype and Colon Polyps Risk

- In a colonoscopy-acquired cohort from Kaiser Permanente Southern California, Henry J. Lin (Harbor-UCLA) collaborated with Robert Haile (UCLA/USC) to collect food records and blood drops for genotyping.
- Eating broccoli more than three times per week was associated with a 20% reduction in polyps in the overall population but a 50% reduction in GSTM1null individuals.

UCLA CNRU Pilot/Feasibility Study:

Lin H.J. et al. Cancer Epi. Biom.Prev.1998;7:647-652

Modulation of Detoxification Enzymes



LTR Hypomethylated



Yellow Mouse

**High risk cancer, diabetes,
obesity & reduced lifespan**

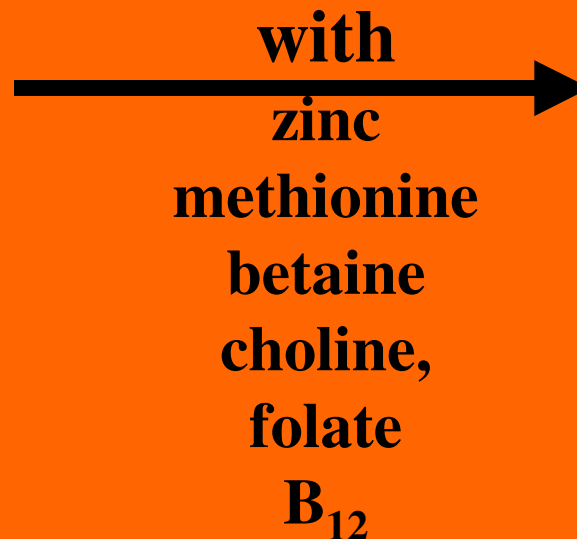
LTR Hypermethylated



Agouti Mouse

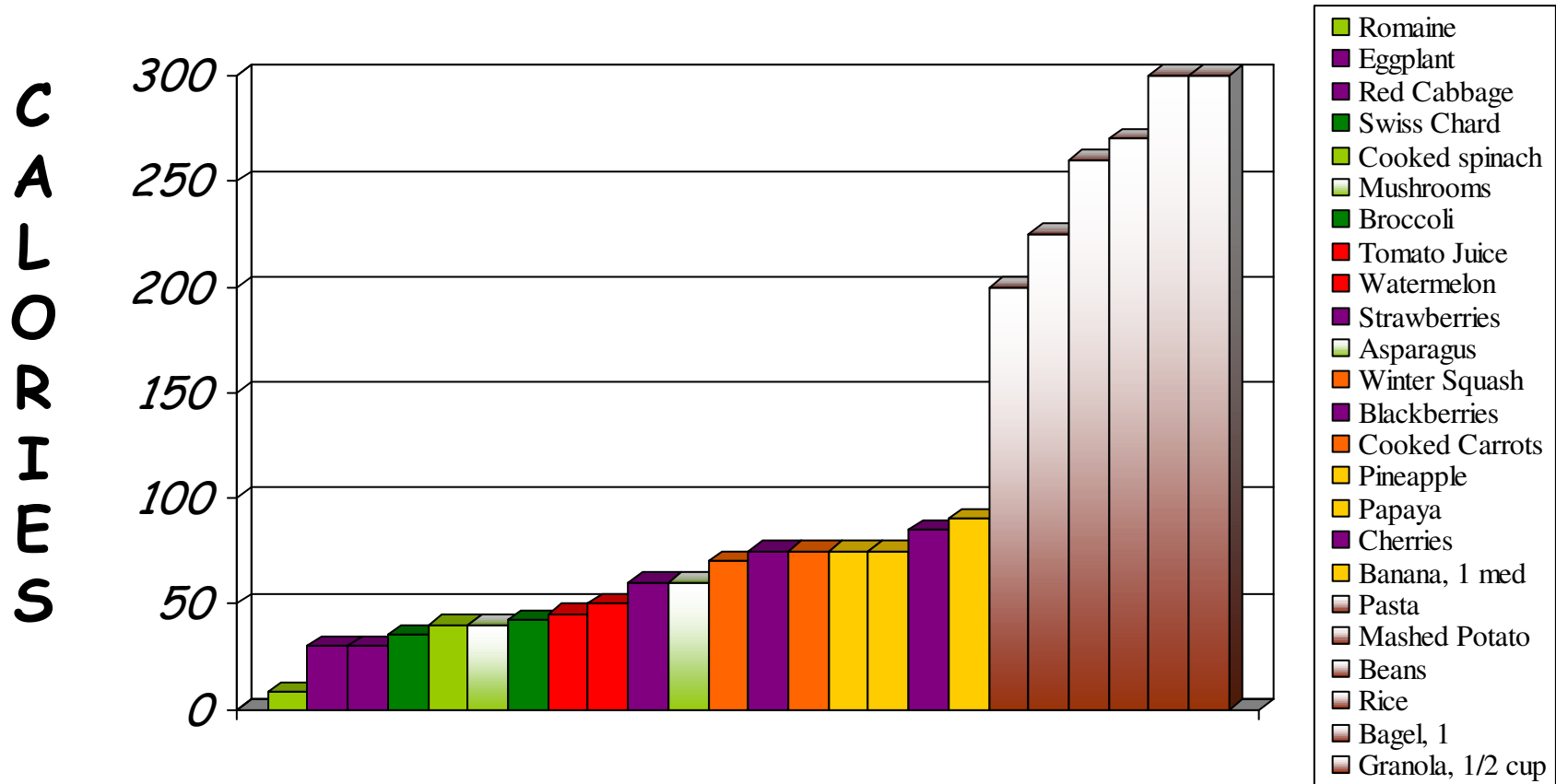
**Lower risk of cancer, diabetes,
obesity and prolonged life**

**Maternal
Supplements**



Colorful Foods Beige ?

Eat More Colors and Weigh Less !



All servings are one cup, unless otherwise noted

THIS IS AN EXTRAORDINARY BOOK! HIGHLY RECOMMENDED."
—DEAN ORNISH, M.D.
LOSE WEIGHT • LOOK GREAT
EAT THE 7 COLORS OF HEALTH!

What Color Is Your Diet?



PROTECT YOUR HEART, VISION, AND GENES
STRENGTHEN YOUR IMMUNITY • REDUCE INFLAMMATION
HELP FIGHT CANCER • ACHIEVE HEALTHY, PERMANENT WEIGHT LOSS
DAVID HEBER, M.D., Ph.D.
DIRECTOR, UCLA CENTER FOR HUMAN NUTRITION
WITH SUSAN BOWERMAN, M.S., R.D.

Color Code for Fruits and Vegetables

Red - Tomato products, soups, sauces, juices

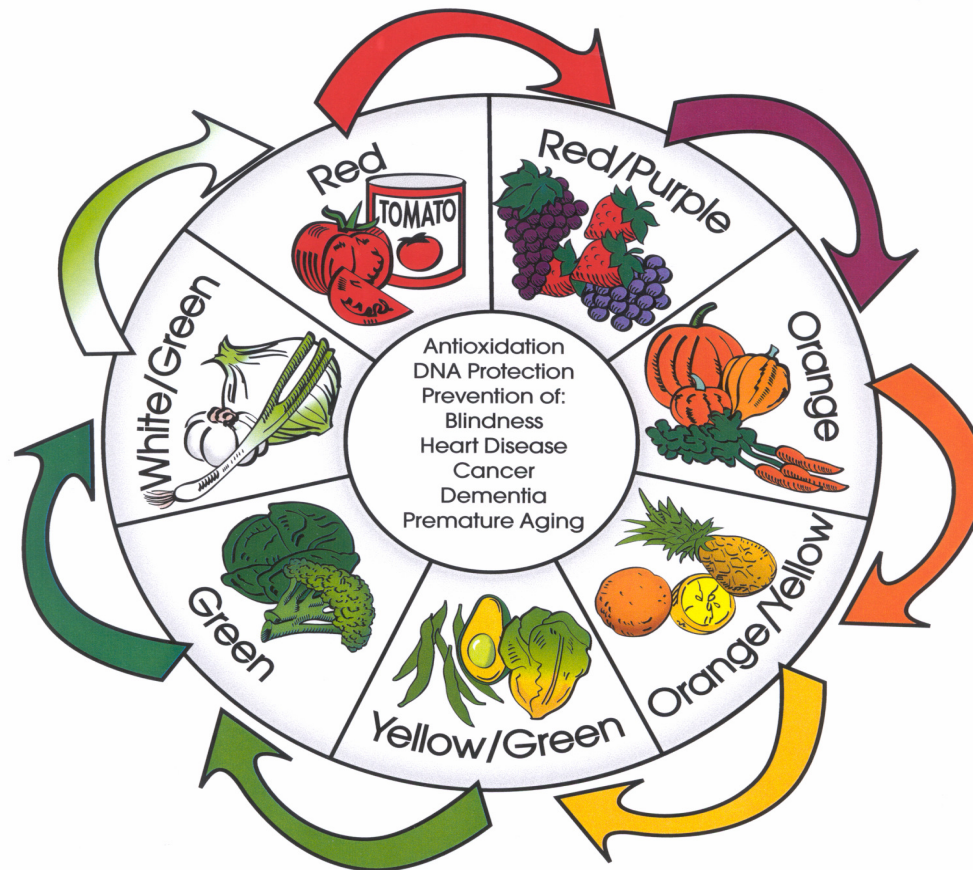
- Red/Purple - Red Wine, Grapes, Berries, Plums
- Orange - Carrots, Mango, Apricot, Sweet Potato
- Orange/Yellow - Citrus Fruits, Papaya, Peaches
- Yellow/Green - Spinach, Corn, Avocado, Green Beans
- Green - Broccoli, Brussels Sprouts, Cabbage
- White/Green - Garlic, Onions, Chives, Asparagus

What Does Color Have to Do With It ?

Colors indicate the presence of specific phytochemicals

- Citrus Flavonoids (**YELLOW/ORANGE**)
- Beta-carotene/Alpha-Carotene (**ORANGE**)
- Glucosinolates, Indoles (**GREEN**)
- Lutein/Zeaxanthin (**YELLOW-GREEN**)
- Lycopene (**RED**)
- Anthocyanins, Ellagitannins (**RED/PURPLE**)
- Allyl Sulfides (**WHITE-GREEN**)

THE COLOR WHEEL OF FOODS



Adapted from "What Color Is Your Diet?", Harper Collins 2001

Obesity, Nutrition, and Cancer

